

# THE VORTEX

AMERICAN CHEMICAL SOCIETY  
VOLUME LXXIX NUMBER 2

CALIFORNIA SECTION  
FEBRUARY 2017



## Project SEED

SUMMER EXPERIENCE FOR THE ECONOMICALLY DISADVANTAGED



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Founder  
Project SEED

PROJECT SEED COORDINATORS  
CALIFORNIA SECTION ACS  
SUMMER 2016

FOR MORE INFORMATION VISIT  
[WWW.ACS.ORG/PROJECTSEED](http://WWW.ACS.ORG/PROJECTSEED)

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*California Section American Chemical Society, February Meeting  
Co-sponsors UC Berkeley, WCC, and YCC  
“Careers Away from the Bench”*

All are welcome in partnership with the College of Chemistry, UC Berkeley Tuesday, February 14, 2017 UC Berkeley Campus Latimer Hall Room 120

**Time** 6:45 p.m. , 7 p.m.–9 p.m. Discussion

**Register** online at:

<https://www.eventbrite.com/e/careers-away-from-the-bench-tickets-31024007642>

Alternative reservation method:

Please register by email to [office@calacs.org](mailto:office@calacs.org), or by phone 510-351-9922.

**Cost.** Free to attendees. Snacks will be provided at 6:45 p.m., in the lobby of Latimer Hall. For additional information visit the Section Calendar on the website [www.calacs.org](http://www.calacs.org)

*Abstract:* In the last four decades, the landscape for chemists seeking employment has changed immensely. There are fewer lab jobs – some due to mergers – and new careers away from the bench have developed. With chemical degrees in hand, some chemists have learned new skills that have taken them to careers they could not have imagined as they studied for their undergraduate chemistry degrees. The panelists will expose you to several distinct fields that rely fundamentally on chemistry. If you have not been thinking about such possibilities, this event will give you the opportunity to hear from chemists whose fields were relatively recently established. You will have the chance to delve into the issues that interest you through your participation in the panel.  
Make a date with your future!

*Speakers:*



Dr. Fiorella Ruggiu,  
Postdoctoral Scholar  
Novartis Institute for  
BioMedical Research



Dr. Eileen Nottoli,  
Of Counsel  
Environmental Law  
Allen Matkins



Dr. Bonnie Charpentier,  
Senior Vice President,  
Regulatory and Compliance  
Cytokinetics, Inc.



Dr. Rachel Mohler,  
Senior Chemist,  
Petroleum Materials  
Characterization Unit  
Chevron



Dr. Jyllian Kemsley,  
Senior Editor  
Chemical &  
Engineering News



Dr. Tashica Amirgholizadeh,  
Corporate Counsel,  
IP Litigation  
Gilead Sciences, Inc.

*California Section, ACS February Meeting*

**Speaker:** Taro Amagata, Ph.D. Associate Professor of Chemistry, Dept. of Chemistry and Biochemistry San Francisco State University.

**Topic:** Exploring Novel Anticancer Lead Compounds from Marine-Derived Actinomycetes Using a Unique Screening Approach

**Time and Place:** Thursday February 2, 7.00 pm, Chevron Research facility in Richmond CA

# THE VORTEX

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California Section Web Site: <http://www.calacs.org>

## Chair's Message

There are many "jobs" that make the California Section work so well, but I hope there are no "thankless jobs."



If you have thought about getting more involved but don't know where to get started, I have a suggestion: Hang out with Alex Madonik at one of the events that

he has organized. He is a great model and a mentor to our members.

He is not an "unsung hero" because the ACS has sung his praises often. I'll join the chorus here, but my real intent is to let you know of the wide range of involvements that are available to you in the Section under the heading of "outreach" and to suggest an easy way to learn the ropes.

According to an interview with Alex, (<http://tinyurl.com/jgforzw>) his involvements started with National Chemistry Week in 1997 when he and Marinda Wu organized a Family Science Night in Orinda, consisting of chemical demonstrations that were understandable and relatable for students and their parents. Here we are 20 years later and Alex continues to organize and present a series of Family Science Night experiences. If you have thought that you'd like to get involved with your children's school or with

such activities in general. I encourage you to join Alex at the Helms Middle School in San Pablo on the evening of March 9. You could be an observer or a novice presenter as a way of testing out this kind of involvement.

On April 22, the Section will participate in Earth Day at the John Muir National Historic Site in Martinez. This could be another entry-level involvement for those who might be interested in educating the public about chemistry.

On September 20, the Section joins the Solano Stroll, another of Alex's initiatives for the Section. If that is convenient for you, you'll find a team of Section volunteers performing demonstrations and interacting with young and old in this fun setting from 10 a.m. until 6 p.m. It's another good place to get acquainted with this aspect of the Section's outreach activities.

Alex has also led the Section's involvement in the Bay Area Science Festival since 2011. This event attracts a huge audience to AT&T Park. It's a great time to experience the many facets of science in the Bay Area as well as a venue to test your interest in public presentations of chemistry. The next Festival will be held near the end of October or early November.

Alex would be happy to answer your queries or sign you up as a volunteer. You can connect with him at [alexmadonik@sonic.net](mailto:alexmadonik@sonic.net).



*CalACS and YCC presents A Night with Prof. Moerner,  
2014 Nobel Laureate*

DATE AND TIME Tue, February 21,  
2017, 7:00 PM – 9:00 PM PST

LOCATION

Bird & Beckett Books & Records  
653 Chenery St.  
San Francisco, CA 94131  
Call Section Office 510-351-9922  
for more information

About Professor W. E. Moerner

Stanford Professor W.E. Moerner was awarded the Nobel Prize in Chemistry in 2014 for his work in super-resolution fluorescence microscopy. The three winners of the 2014 prize – Moerner, Eric Betzig of the Howard Hughes Medical Institute, and Stefan Hell of the Max Planck Institute – pioneered techniques that capture optical images on the nanometer scale.

Moerner established himself early in the field of super-resolution spectroscopy at the start of his career in another research institution in the Santa Clara Valley ACS area – the IBM Almaden Research Center. In 1989, he and his IBM group reported measuring the light absorption of a single molecule.

His group at Stanford has extended the 2D and 3D super-resolution imaging into cells, capturing the motion of cellular components in three dimensions in real time. They also study the photodynamics of single trapped biomolecules in solution. Professor Moerner will speak about the road to the Nobel Prize, how it arose out of spectroscopy at an industrial lab, and the impact of where it is leading.

Read more here: <http://web.stanford.edu/group/moerner/WEM.html>

*California Section 2016 SEED Program Report*

Students:

Students for the 2016 California Section SEED program consisted of 23 females and 28 males. (See Attachments I and II.) Our program started with 39 SEED I students and 12 SEED II students.

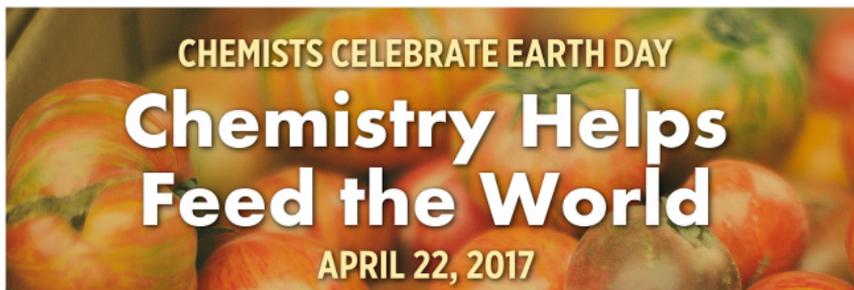
This year marked the second year in which males outnumbered females in our program during the time I've been coordinator—about 34 years. I am not sure what this means. Luckily, we recruited two students from Kennedy High School in Richmond, CA. This school has had a sporadic participation in SEED. It is from the West Contra Costa Unified School District (WCCUSD). Chevron, our corporate partner, is very interested in having students from such schools.

Two SEED II students were awarded full four-year scholarships to attend UC Berkeley (Haley Liu) and UC Santa Cruz (Itzel Gonzalez). Both are majoring in a science field, just not chemistry.

Scholarships:

One California Section student (Laivong Thung) won a \$5,000 SEED scholarship for

*(continued on page 8*



## Celebrate Earth Day with the ACS “Chemistry Helps Feed the World”

We're off to an early start with public outreach in the California Section this spring and you can help!

Family Science Night returns to Helms Middle School in San Pablo, CA on Thursday, March 9<sup>th</sup>, 6 PM to 8 PM. The Scientific Jam band and Bryan Balazs will be there to open the show with music and some thrilling chemical demonstrations. Students and their families will discover a dozen or more hands-on activities, and that's where we could use your help. Whether you are an experienced outreach volunteer, or curious to see one of these events for the first time, you can join the fun and also share your love of chemistry with the public. To volunteer, please contact Alex Madonik at 510-872-0528 or [alexmadonik@sonic.net](mailto:alexmadonik@sonic.net)

The California Section returns to the John Muir National Historic Site in Martinez, CA. for this year's celebration of Earth Day (and John Muir's birthday) on Saturday, April 22<sup>nd</sup>, 2017, 10 AM to 4 PM. We will join dozens of other community groups to share ideas, souvenirs, and hands-on activities with hundreds of visitors. At the Cal ACS canopy location, demonstrations and hands-on activities will relate to the ACS Earth Day 2017 theme, “Chemistry Helps Feed the World.” We will have copies of Celebrating Chemistry (in English and Spanish) with activities that families can try at home, as well as Periodic Table wallet cards, UV-Detection cards and other cool souvenirs.





## Only at Oklo? (Part 3) by Bill Motzer

In Part 1 (September 2016 Vortex) I described the history behind the first

human sustained nuclear reaction in 1942 with the construction of Chicago Pile 1. In Part 2 (December 2016 Vortex), I noted the prediction and subsequent discovery of the ~1.8 billion year old natural nuclear reactors in Gabon, West Africa known as the Oklo uranium deposits. So how did this unique phenomenon come about? To understand this, we need to know something about the physical characteristics of these ore deposits.

The Oklo and adjacent Okelobondo mines consist of several mineralized zones containing uranium mineralization in sandstone and conglomerate of the Francevillian Formation. These rocks, and their contained subsequent mineralization, were deposited in a deltaic-type sedimentary basin: such deposits are also known as stratiform as they form continuous and “stacked” layers. There are also zones or layers of shale and organic materials probably from algal mats similar to stromatolites. However, some of the contained organic matter has been described as “asphaltic.” Within these layers are mineralized zones ranging from about 5 to 8 meters in thickness with mineralization consisting primarily of the uranium oxide minerals uraninite/pitchblende (mostly  $UO_2$ , but due to oxidation variable proportions of  $U_3O_8$  may occur). Age of deposition has been determined to be about 1.74 (+0.20) billion years ago (Ga). The uranium sources are believed to have been local upriver igneous alkali granite intrusives. Most uranium (and thorium) in such granites are generally dispersed in accessory minerals such as zircon ( $ZrSiO_4$ ), monazite ( $Ce,LaPO_4$ ), and apatite [ $Ca_5(PO_4)_3(F,Cl,OH)$ ].

Until the rise of free oxygen in the atmosphere to about one percent of present levels, uranium contained in the granitic rocks could not be mobilized. This may have occurred just about this time as sug-

gested by oxidized fossil soils dated about 2.1 Ga. Once mobilized, dissolved uranium concentrations were probably in the parts per million (mg/L) range. Although uranium is generally highly soluble in oxygenated waters, it is relatively insoluble in anoxic waters. Therefore as the uranium-rich river water encountered a reduced environment, dissolved uranium precipitated out of solution as it crossed the oxidation/reduction front of the organic horizons. Anaerobic bacterial action may have also enhanced this process. Over a period of perhaps 200 million years, several thousand tons of uranium were deposited and concentrated in the algal mats. The sedimentary rocks of the Francevillian were then buried, consolidated, and subsequently uplifted and tilted about 45 degrees by tectonic forces to their present positions (Figure 1). During tectonic uplift fractures formed that were then filled with uranium minerals probably exceeding 10 percent uranium. With a natural  $^{235}U$  content of about 3% (the approximate amount required for artificially enriched uranium used in most modern nuclear power plants) the nuclear reactions occurred within these enriched zones (Figure 2), and in the next article I will described this process.

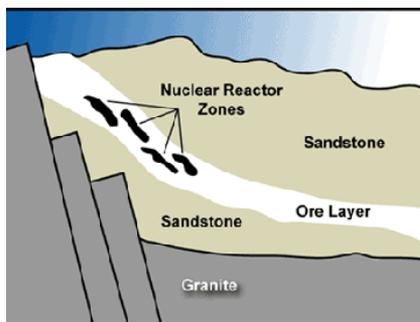


Figure 1: Schematic cross section of the Oklo uranium deposits and the natural nuclear reactors. Modified from [https://commons.wikimedia.org/wiki/File:Gabon\\_Geology\\_Oklo.svg](https://commons.wikimedia.org/wiki/File:Gabon_Geology_Oklo.svg).

(Motzer continued from page 6)

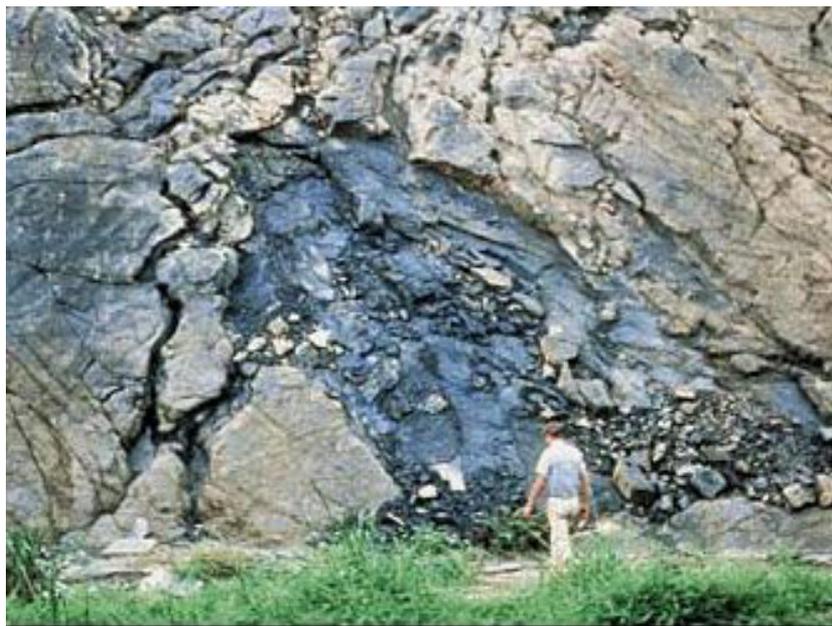


Figure 2: Fossilized reactor zone within the Oklo uranium deposit. Photo source same as Figure 1



### *Gifts & Donations*

As noted by the Chair, the Section has many outreach programs to help support science and chemistry in our community. You can help support the programs by volunteering your time, a couple of hours or more. The Section is also grateful for donations in general or for specific program. E-mail and find out how your valued contribution can be used.

Lou Rigali, LR101898@aol.com



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her first year of college at UC Berkeley, contingent on her taking chemistry in her freshman year. She was a 2016 SEED II student at UC Merced. Laivong is convinced that SEED helped her prepare for college. Tsz Yan (Nancy) Ng, another CA Section student, participated in SEED at Libby Labs in 2013, and at Chevron in 2014, earning the same \$5,000 scholarship. This is certainly good news because Nancy went to Kennedy High School in Richmond, CA during the short tenure of a very good chemistry teacher who left the school after two years.

#### Student Interviews, Scheduling, Symposia:

To arrive at our 51 participants, the Project SEED Committee interviewed over 110 students. I personally talked to all the SEED candidates. Stockton students started their Project SEED experience right after school was out in early June, so we had to finish interviewing quite early (first two weeks of May). The other students in our system started in mid-June. Eight symposia capped our SEED program, with five, six, or seven students each. The symposia were held all over Northern and Central California. See Attachment III to see where the students worked. I attended all student presentations.

Before we could interview the students, we needed to encourage them to apply. The Kennedy High School situation is the most problematic. Teachers leave as fast as they can find another job. My current contact is a Teach for America teacher, and he will not be there for much longer. The Acting Associate Area Director of the USDA Albany lab, Dr. Charles Onwulata, contacted me to ask if we could partner to recruit Kennedy students for SEED, since his lab is very close to this school. With this common goal, Charles and I held an information meeting at the school, with chemistry teacher Harrison Blatt as the host. Twenty-two students attended. From that group, I received only two applications; one student could not work at USDA (non-citizen), so Charles got only one SEED student. This is one reason it is hard to grow SEED in disadvantaged school districts. Charles and I hope that at least one of these SEED students will want to do SEED II. Furthermore, the teacher told me that the District is thinking of closing Kennedy High School if it can't get its student test scores to rise.

This was the first summer where two of the SEED I students from Central California are attending the same high school I graduated from almost 50 years ago.

#### Mentors and Worksites:

Attachment III shows the list of various worksites. Wally Yokoyama is now the USDA Site Coordinator. Wally recruited seven mentors from the Albany site, an increase over 2015. How did he do this? Wally had an idea that I did not think would work: at the USDA, where food is what they do, everyone there can be enticed by a cake-and-coffee event. We thanked last year's mentors and welcomed new ones. By the way, one of the new SEED helpers to current mentor S. Throne, Doris Feng, is a former SEED student. She is now a permanent employee of the USDA Albany lab. This is clear evidence that SEED works. The University of the Pacific (UOP) had seven students working under the local coordination of Professor Qinliang Zhao. They maintained their all-time high count of mentors and students. I show evidence of how pleased the Chair of the department, a SEED mentor, was with his student in Attachment IV.

Chevron's co-coordinator, Ken Nelson, arranged ten student/mentor pairs. Seven of the students working at Chevron attended West Contra Costa Unified School District (WCCUSD) high schools, and these are the students Chevron wanted their financial contribution to support. In fact, Chevron donated \$22,000 for 2016, but since there were seven students from WCCUSD (five SEED I and two SEED II), Chevron requested \$3,500 be saved for 2017 in the Development Office.

*(Continued on page 9)*

Dr. Gary Banuelos of the USDA Parlier labs continued his mentor recruiting efforts with nearby California State University Fresno (CSUF). Together, CSUF (three mentors) and Parlier USDA (four mentors) hosted seven SEED students. It appears that the CSUF faculty is interested in future SEED summers with our CA Section SEED program, even though they reside in a different section.

#### Teachers:

As Attachment II shows, we had many teachers nominate their students this year; some were new. There are committed teachers all over Northern California who are willing to find that special student. Especially in the rural areas (Fairfield, Stockton, Merced, Parlier), we have dedicated teachers who find qualified students whose eyes might not yet be opened to the opportunities of higher education, and where no one in the family has yet completed college. These teachers allow ACS to connect with such students. I was pleased to offer the SEED program to seven students at UOP in Stockton, eight at UC Merced, four in Fairfield (two of whom worked in Berkeley labs), and seven at USDA in Parlier/CSUF.

#### Contributors:

SEED I students earned \$2,500 and SEED II students earned \$3,000, the same as in 2015. We required \$133,500 to have a program of 51 students. Our major donors this year consisted of the local Section ACS, through carryover from 2015; the Chevron Corporation (\$22,000), who has sponsored Project SEED students for nearly the entire history of my participation in the program; the University of California at Merced; and the Cortopassi Family Foundation. A repeat contributor is Bio-Rad Laboratories, who indicated that they would like a report on “their” new students, which I provided.

The National ACS helped our program quite a bit this year, and the California Section ACS members also contributed. (See Attachment V.)

#### Telephone Tree:

The telephone tree system was put into place to allow mentors and students to be contacted every other week by a SEED volunteer. (See Attachment VI.) We called either the mentor or the student on alternate weeks to make sure that the student/mentor pair was intact and flourishing. Another function of the telephone tree is to ensure accurate pay distribution. We made sure that the SEED telephone contact person was invited to the talks given by the SEED student for whom they were responsible. Note that most students are also email accessible. At the end of the year, we provided all students with each other’s email addresses in case they wanted to communicate with one another.

#### Communications:

In Attachment VII is a Richmond Standard front page story on SEED. A reporter sat in on one of the eight symposia to gather the information. This story shows that SEED students do important work for the mentors, pertinent to the business aims of the Company.

An invitation came from Dr. Onwulata for me to speak about SEED at the Pacific West Area Workforce Diversity Committee Training Workshop, held on April 5, 2016. Although the USDA in Albany has been doing SEED for decades, their sister labs were unaware of the program. Hopefully, some members of the Committee will encourage their local scientists to participate in SEED. Dr. Onwulata also arranged for a story on SEED to appear in an official USDA publication (see Attachment VIII), which I helped to write. He was

*(Continued on page 10)*

on temporary assignment to the USDA Albany lab for only one year.

Another speaking invitation came from the Rotary Club of Orinda for March 30, 2016 (see Attachment IX). Recall that my late SEED coordinator colleague, Dr. Glenn Fuller, was also a member of the Rotary Club.

This event was followed by another invitation from the local American Association of University Women for November 19, 2016 (see Attachment X). A donation to CA Section SEED resulted.

Opportunities to reach out to former SEED students were provided by two events hosted by the ACS Development Office in late September to show gratitude to those who had supported the program over the years in this area. I was asked to contact former students in the Bay Area. Although I found three former SEED students working at Bio-Rad Laboratories, the timing did not allow them to attend the September 25, 2016, event in Oakland. But the event brought Dean Juan Meza and Professor Erik Menke from UC Merced. To get to Oakland, this is a 2.5-hour drive, one way. This shows their commitment to SEED. The next day was another event at Genentech, and three former SEED students (Doris Feng, Frank Sit, and Dr. Christine Sit) were present. They are all doing well, and they all attribute part of their success to SEED.

As for UC Merced's SEED Program, we held a SEED Symposium there on August 2, 2016, where the eight students reported on their research. Drs. Andy and Patti Li Wang are a husband and wife team that has grown their program rapidly. Provost Tom Peterson attended the event and gave the opening remarks. This was the second time a high official of the university administration attended this event. I was pleased to meet him in person, as he arranged for part of the UC Merced donation, the other part coming from the chemistry department of the university. This university is determined to include its local Hispanic and Southeast Asian population in the scientific activity. It is the only University of CA located in California's Central Valley.

#### Other Notes:

Our Section 2015 SEED Program was a finalist of three programs in the ChemLuminary Awards competition; California won this year.

In summary, this was a very successful year for Project SEED in California. I appreciated the help from the following people during this period: Wally Yokoyama, Ken Nelson, Chamroen Eng, Qinliang Zhao, Julie Mason, Jim Hudson, Toni Miao, Michael Cheng, Andy Li Wang, Patti Li Wang, Gary Banuelos, and many other volunteer mentors.

Thanks to the Development Office, I connected with some of my former SEED students, now college graduates, who are now working at Chevron, Bio-Rad Labs, the USDA Lab in Albany, and Apple. If this is not proof that SEED works, I do not know what is.

E.S. Yamaguchi

#### Editor's note

There are a number of people in the California Section whose dedication and energy are an inspiration. Dr. Elaine Yamaguchi is one of those people, a volunteer even as she had a full time career at Chevron. Elaine continues, in retirement, to advance Project Seed for the Section. She gets help of course but coordinating the activities of over 150 people: students,, teachers, and mentors, plus handling the funds from about 8 sources is like running a \$30 million company. If that is not inspirational, I do not know what is. If you have not read the 2016 Project SEED report in this issue, I recommend that you do. There is a complete report with tables and more detailed information on the students, teachers, and mentors on [www.calacs.org](http://www.calacs.org).



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